Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

PHYSICS 0625/3

PAPER 3

Tuesday **25 MAY 1999** Morning 1 hour 15 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator and/or Mathematical tables
Protractor
Ruler (30 cm)

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
TOTAL	

This question paper consists of 13 printed pages and 3 blank pages.

[Turn over

1 Fig. 1.1 shows a plan view of a rotating sprayer used for the watering of crops.

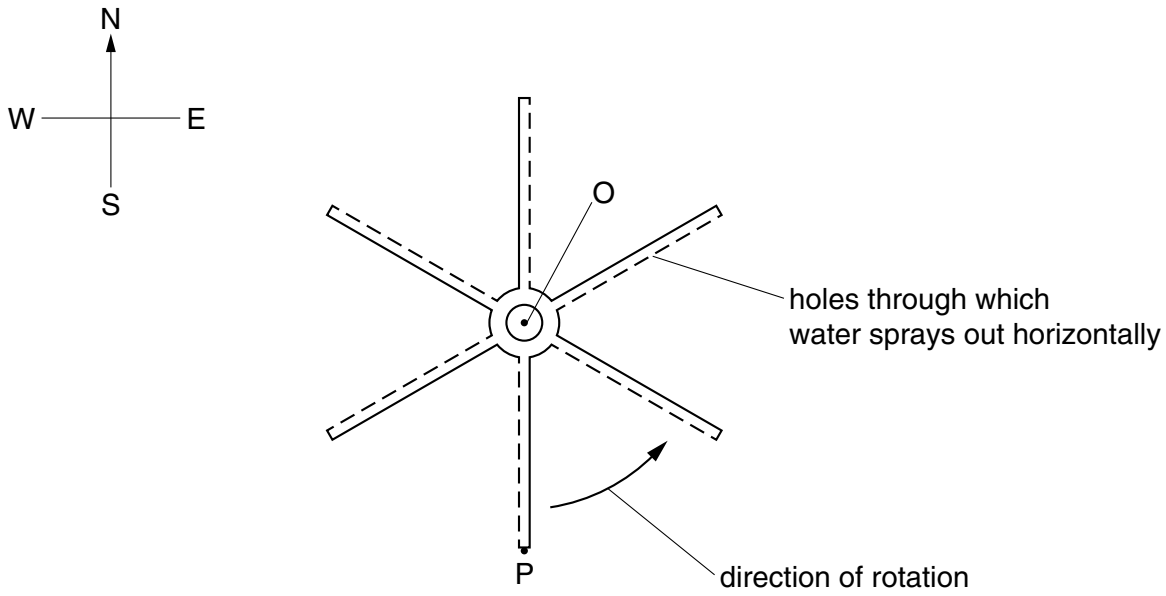

Fig. 1.1

(a) The device rotates about O at a constant rate of 0.2 revolutions per second. OP is 10 m long.
Calculate the speed of the point P. (The circumference of a circle is 2π x radius.)

speed = ... [4]

(b) (i) Use your answer to **(a)** to write down the **velocity** of the point P when P is at the point shown in Fig. 1.1.

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(ii) Explain why the **speed** of point P is constant but its **velocity** changes as the sprayer rotates.

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.....
[4]

(c) Explain how you know that there is a net force at the end of the arm P, acting towards O.

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.....[3]

Question 1 is continued on page 4

(d) Water is forced out of the sprayer horizontally. Fig. 1.2 shows how the horizontal speed of the water changes between leaving the sprayer and hitting the ground.

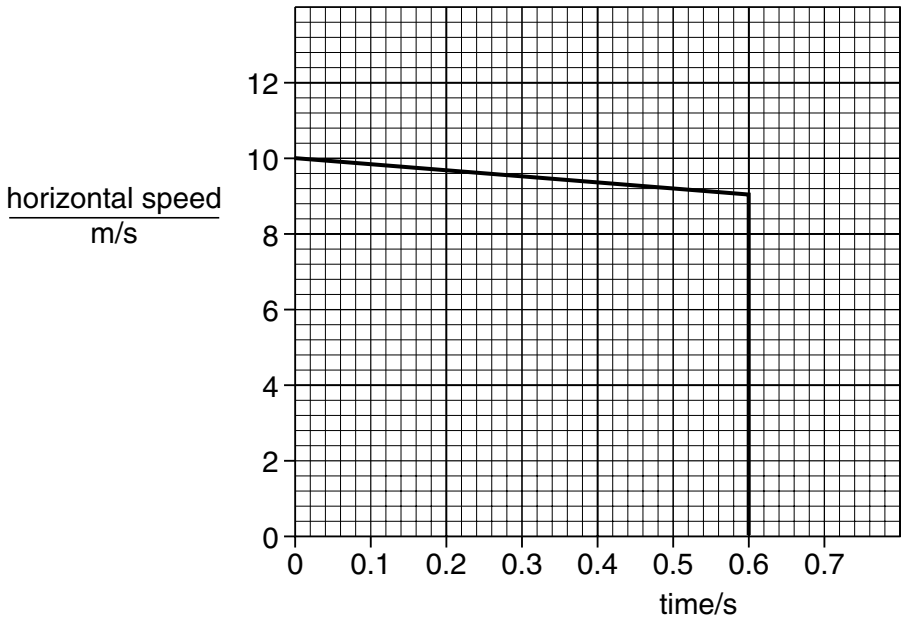

Fig. 1.2

(i) Explain

1. why the horizontal speed decreases slightly over the 0.6 s of the motion,

.....

.....

2. why the line is approximately vertical at 0.6 s.

.....

.....

(ii) The acceleration of free fall is 10 m/s^2. Calculate

1. the height above the ground at which the water leaves the sprayer,

height = ...

2. the horizontal distance travelled by the water.

distance = ...

[7]

(e) Fig. 1.3 shows the path of the water at one instant. The pressure of the water on an object placed at point Q is much greater than the pressure of the water on the same object when placed at point R.

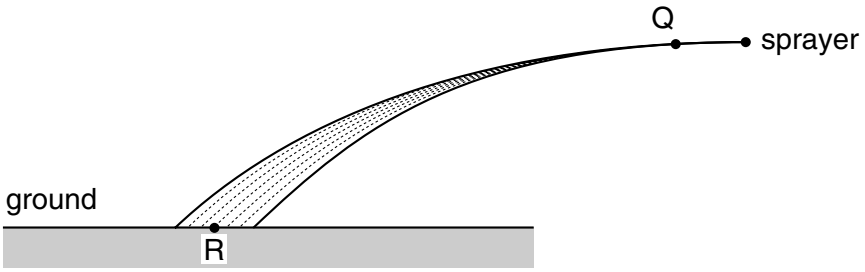

Fig. 1.3

The pressure exerted by the water on the object at point Q is 5×10^5 N/m^2 and the pressure on the object at R is 1×10^5 N/m^2.
Explain this decrease in pressure.

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.....[4]

2 A student attempted to find the specific heat capacity of water using the following data obtained from the heating system of a small swimming pool:

mass of water in the pool, heating system and circulation pipes, 54 000 kg;
power of the heating system, 30 kW;
rise in temperature, 2 °C in 5 hours (18 000 s).

(a) Assuming no energy loss, use these data to calculate a value for the specific heat capacity of water. Show your working.

specific heat capacity ..... [6]

(b) The student found that the value for the specific heat capacity of water, worked out by this method, was higher than the accepted value.

The average temperature of the water in the pool during the test period was 24 °C, whilst the average temperature of the air was 19 °C.

(i) Describe, in molecular terms, ways in which the water loses heat from its surface.

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(ii) Explain why the loss of heat from the water led to the student's higher value.

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[7]

3 **(a)** A converging lens of focal length 4.0 cm is used to produce a virtual image which is 3 times the height of the object.
Fig. 3.1 shows the lens position and the focal length PF. The length PF is to scale.
The object and the image are both on the left-hand side of the lens but their positions are not shown.

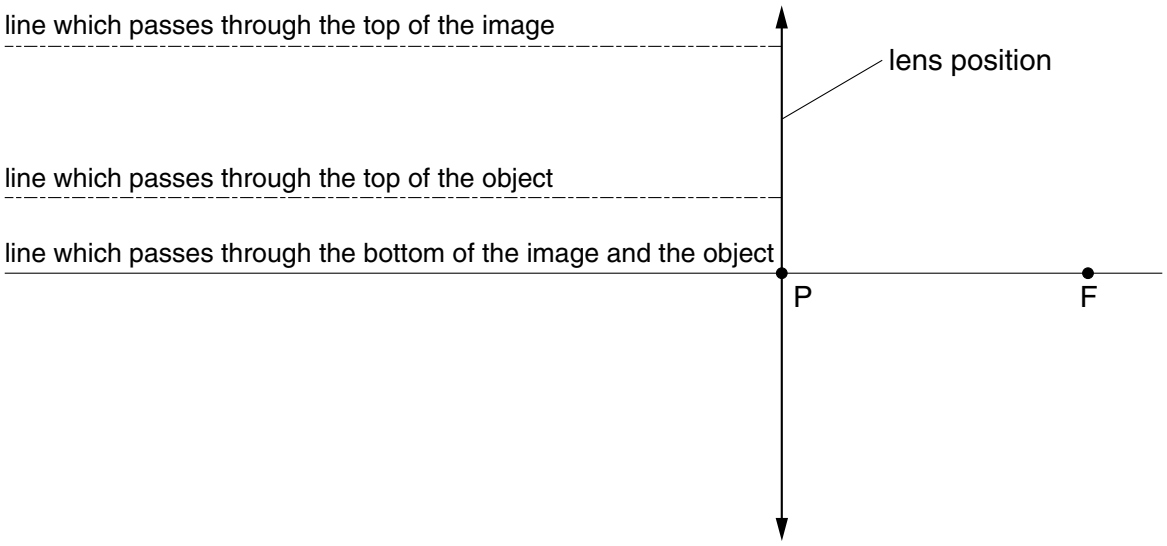

Fig. 3.1

Draw rays on Fig. 3.1 and determine

(i) the scale used, ...

(ii) the distance of the image from the lens, ...

(iii) the distance of the object from the lens. .....

[6]

(b) Fig. 3.2 shows a wide parallel beam of monochromatic light incident on a block of glass at an angle of 37°.

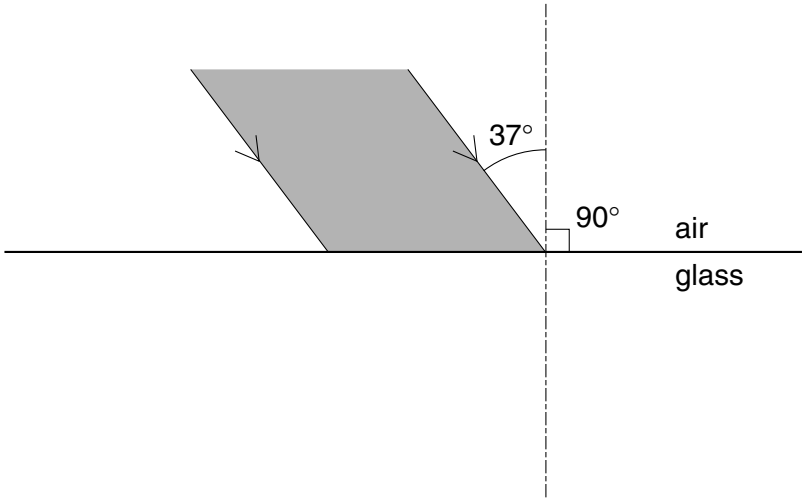

Fig. 3.2

(i) What is meant by the word *monochromatic*?

.....

.....

(ii) State the approximate speed of light in air.

.....

(iii) The angle of refraction in the glass is 22°. Calculate the refractive index of this glass.

refractive index = ...

(iv) On Fig. 3.2, use your protractor to draw in the path of the beam of light in the glass. [7]

4 Fig. 4.1 shows part of a cathode-ray tube.
An electron beam PQ is entering the region between two horizontal, charged metal plates.

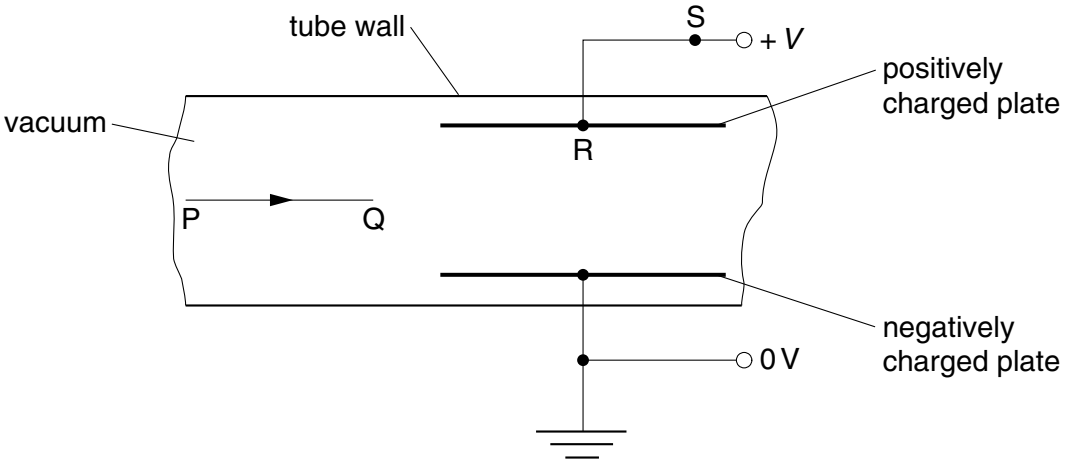

Fig. 4.1

(a) (i) On Fig. 4.1, draw the electron beam from Q to show its path between the charged plates.

(ii) Explain any change of direction of the electron beam when it is between the charged plates.

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.....

.....

(iii) On Fig. 4.1, show the direction of the conventional current in the electron beam by drawing an arrow and labelling it D.

[5]

(b) The voltage across the plates is increased so that one of the plates collects 10^{14} electrons in 10 s. Each electron carries a charge of 1.6×10^{-19} C.

(i) Calculate the total charge collected by the plate in 10 s.

charge = ...

(ii) State an equation linking charge and current. Hence calculate the current in wire RS.

.....

current = ...

[4]

(c) Air containing charged dust particles flows between two metal plates. A high potential difference is connected across the plates as illustrated in Fig. 4.2.

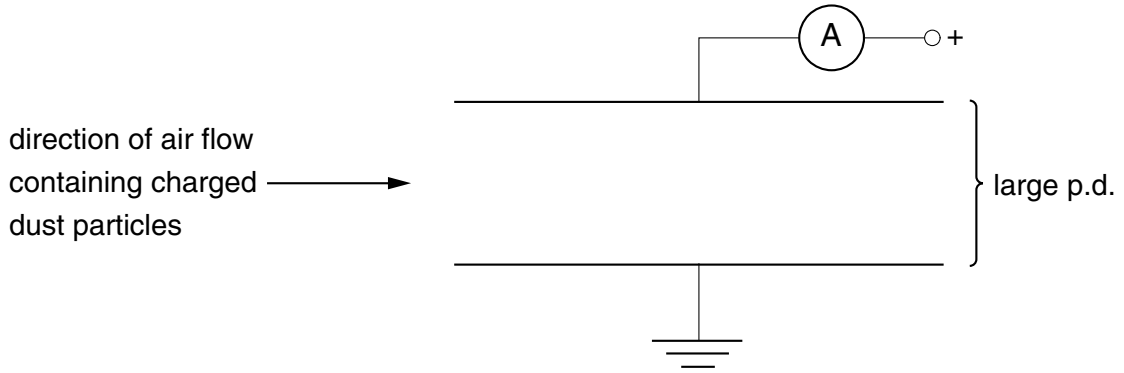

Fig. 4.2

The charged particles are attracted to the upper plate and move through a potential difference of 10 000 V. The ammeter records a current of 2.1×10^{-6} A.

Calculate

(i) the energy supplied by the voltage source in 10 minutes (600 s),

energy = ...

(ii) the power supplied.

power = ...

[6]

[Turn over

(d) Fig. 4.3 shows a beam of electrons entering the magnetic field of a coil. This magnetic field is directed into the paper.

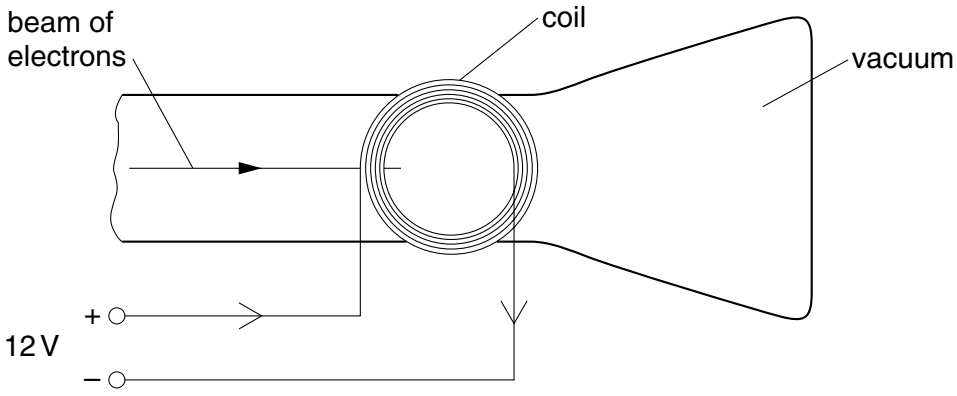

Fig. 4.3

(i) On Fig. 4.3, sketch the path of the electron beam until it hits the end of the tube. Explain your choice of path.

.....

.....

.....

.....

(ii) The resistance of the coil producing the magnetic field is 100 Ω. Calculate the current in the coil.

current = ...

(iii) State the effect on the electron deflection of increasing **and** reversing the potential difference connected across the coil.

.....

.....

[7]

5 **(a)** A laboratory needs to find a radioactive isotope which will produce very intense ionisation of air.

The apparatus is shown in Fig. 5.1.

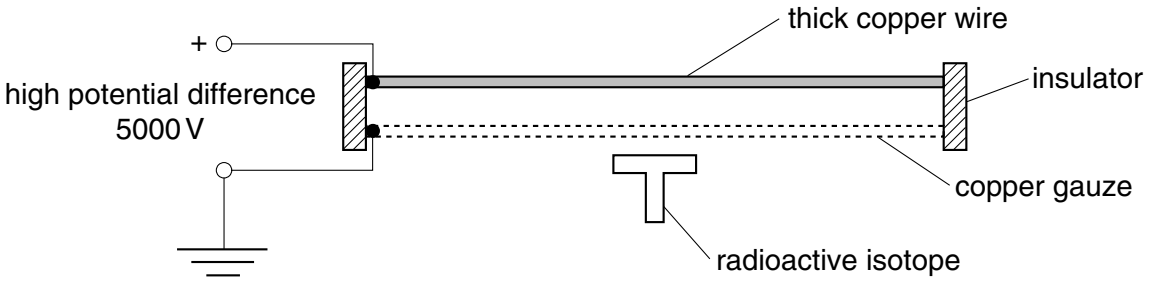

Fig. 5.1

(i) Explain why sparks jump between the gauze and the wire when a radioactive isotope with high ionising properties is brought near the gauze.

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(ii) An α-emitting source, a β-emitting source and a γ-emitting source, each of the same activity, are tested. One source gives no sparks at all, the second gives only a few sparks per second and the third many sparks per second. State the relative quantities of ionisation produced by each type of emitter.

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.....

[6]

(b) Some of the results of a comparison between α-particles, β-particles and γ-rays are shown in the table below.

	α	β	γ
mass	4 units		
constitution	2 protons + 2 neutrons		
charge	+2 units		

Complete the table by filling in the blank boxes. [4]

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